THE EXPLOSIVES ENGINEER

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Forerunner of Progress in Mining, Quarrying, Construction

VOL. 29 NO. 6 NOVEMBER-DECEMBER, 1951

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Views and opinions expressed by the authors of articles in this publication are their own, and they do not necessarily represent those of the publisher.

Where the north fork of the American River joins its parent stream, just above California's State Prison at Folsom, the U. S. Bureau of Reclamation and the Army Corps of Engineers are supervising the construction of a $65,000,000 flood control and irrigation dam and hydroelectric power plant. Five contracting firms are at work on the building of this huge multiple-purpose project. The drilling, blasting, and excavating of large quantities of rock formations, which vary from disintegrated granite intermixed with large boulders to solid granite, pose difficult operating problems.

On page 170, Robert Lee Behme reviews the satisfactory progress being made by the contractors, despite the difficulties that nature and man have imposed upon them.

• •

Cuba's Camoa Quarry, located near the town of Jamaica in Havana Province, began doing business in 1898 and has been in production uninterruptedly ever since. In 1949, under the management of Carlos M. Coroalles, new, modern equipment was introduced, and improved operating methods were adopted. Today the Camoa Quarry is the largest producer of commercial crushed stone on the Island of Cuba. A description of the property, with particular emphasis on a recent tunnel blast of 45,500 pounds of dynamite, is presented in an article by Nelson Wall on page 167.

• •

The Moles Awards for 1952 will be presented to Stephen D. Bechtel, president of The Bechtel Corporation, San Francisco, and to Charles B. Spencer, president of Spencer, White & Prentis, New York, at the twelfth annual dinner-meeting of the association in New York, February 6. The announcement of the winners stated that Mr. Bechtel and Mr. Spencer were selected because of their outstanding contributions to construction progress. Approximately 1,000 prominent contractors, engineers, and manufacturers' representatives will be in attendance. A preview of the coming event may be found on page 178.

• •

Michigan Limestone & Chemical Company's quarry at Rogers City, Michigan, was operated for 1,273,376 man-hours last year with no disabling injuries. This remarkable record won top honors in the National Safety Competition of 1950. The Sentinels of Safety trophy and flag were awarded to the quarry employes at impressive ceremonies on July 19. The highlights of this happy occasion are summarized in the article on page 176.

• •

The U. S. Navy's decision to remove a dirigible hangar 1,090 ft. long, 220 ft. wide, and 180 ft. high, at its base in South Weymouth, Massachusetts, set the stage for a contractor to demonstrate the efficiency and economy of blasting with industrial explosives on demolition projects. The job called for blasting huge structures of reinforced concrete and steel with which the hangar was faced. For an account of some of the details on this unusual assignment, please turn to page 174.

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The concluding chapter in C. Carleton Semple's article "Tales of a Gold Miner in Nicaragua" is presented in this issue, beginning on page 180.

EDITORIAL STAFF: JOSEPH I. HORTY, *Managing Editor;* ELIZABETH M. JOYCE, *Assistant Editor;* GERTRUDE A. DONNELLY, *Assistant Editor;* EDWARD L. GRANT, *Art Editor;* FRANK J. CANOVA, *Production Manager;* CHARLES E. RABENOLD, *Advertising Manager;* THEODORE MARVIN, *Director;* MONTGOMERY R. BUDD, *Associate Director.*

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CCA

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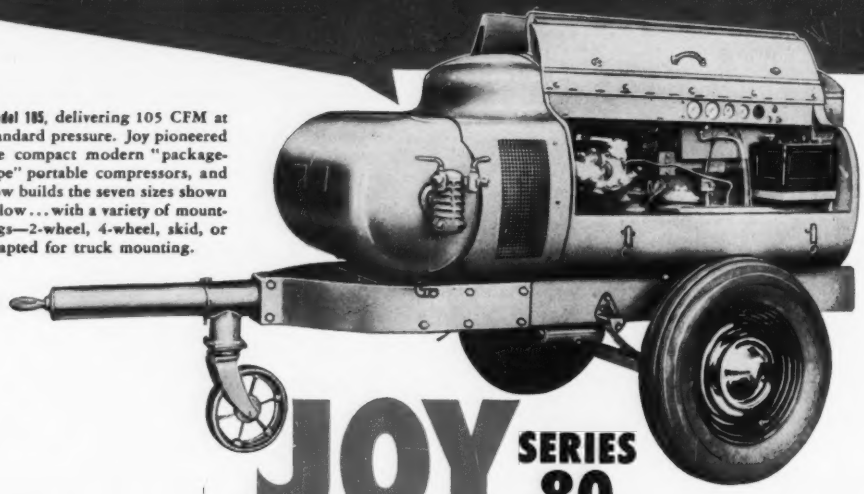

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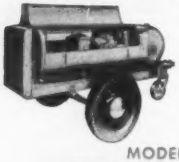
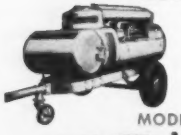
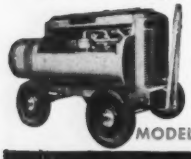


MODEL 60



MODEL 160



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R. L. McCann

PRESIDENT

THE NEW JERSEY ZINC COMPANY

A Biography

LEADERSHIP in American industry today demands men equipped not only with executive talents, sound training, and wide experience, but also with the ability to stimulate others and to enlist their enthusiastic cooperation. One such leader is R. L. McCann, president of The New Jersey Zinc Company.

"Mac," as his friends and associates know him, was born February 22, 1896, in Harrisburg, Pennsylvania, the son of James P. and Nelle (Hammaker) McCann. His father, a general contractor, was also associated with the Pennsylvania Railroad for many years as a supervisor of construction of signal equipment. His mother, an accomplished musician, specialized in playing the pipe organ. While still in her teens, she was appointed organist at The Second Reformed Church in Harrisburg and continued in that capacity for fifty-one years.

Mac received his elementary education in a local grade school and completed the college-preparatory courses in Harrisburg Technical School. He was actively identified with his school athletic teams—a four-letter man at Harrisburg Tech. In his senior year, he was captain and quarterback of the Tech. football team that won national recognition among the top preparatory-school and high-school teams in the country. In reminiscing about those early school years, Mac commented especially on the rugged practice sessions. "On Thursday afternoons," he said, "we scrimmaged with the Indians, at nearby Carlisle, with the fabulous Jim Thorpe in their backfield. Our coach was a friend of Pop Warner. Such rough, tough conditioning made our regularly scheduled games seem like mere romps."

In 1913, he went to Lehigh University and was graduated in 1917 with the degree of Engineer of Mines. Because of a serious injury received during the latter part of his football career at Harrisburg Tech., he had to forego participation in athletics at the university. During summer vacation months, he worked at various jobs in the engineering and construction departments of Pennsylvania Steel Company at Steelton and Bethlehem Steel Company at Lebanon.

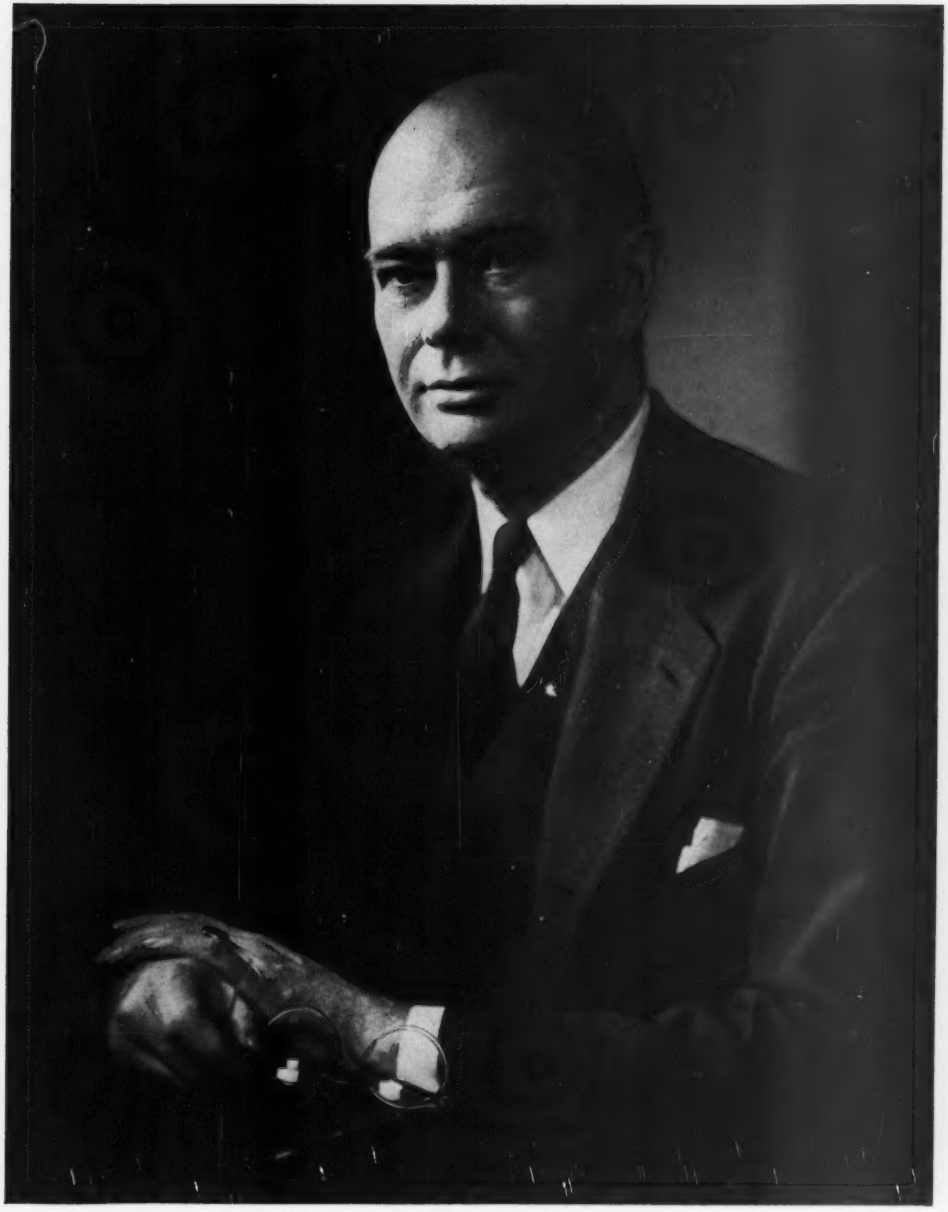
Following his graduation from Lehigh, he took a job with The New Jersey Zinc Company as a surveyor in the engineering department at the company's mines in New Jersey. Promotions followed in logical succession: chief surveyor; chief of construction at Franklin; mill chief at Sterling; assistant mill superintendent at Franklin-Sterling; general manager of all company mines; assistant to the president; vice president; and director. On February 28, 1951, the board of directors elected him to the presidency of the company.

During the early years at Franklin, Mac was active in promoting football, baseball, and basketball teams, and in the formation of an athletic association that included company employes and other interested people in town. He devoted much of his free time to coaching the players. The teams were successful and an athletic field was built from the proceeds of the games. Upon his recommendations, several of the players received athletic scholarships from preparatory schools and universities, where they attained national prominence in the field of sports and, later, became successful business executives.

In addition to directing the affairs of his company's mines and plants in New Jersey, Pennsylvania, Virginia, Illinois, Colorado, and New Mexico, Mr. McCann is the president and a director of the following: The New Jersey Zinc Exploration Company; New Jersey Zinc Explorations, Limited; The New Jersey Zinc Company (of Pa.); The New Jersey Zinc Sales Company; The Bertha Mineral Company; Empire Zinc Company; Mineral Point Zinc Company; Chestnut Ridge Railway Company; The Saucon Valley Iron & Railroad Company; Smith Valley Realty Corporation; The Franklin Water Company; The Palmer Land Company; Palmer Water Company; Palmerton Disposal Company; The Franklin Hospital; and The Palmerton Hospital. He is also one of the directors of American Zinc Institute for the term ending 1954, and of Quebec Iron & Titanium Corporation. He was a director of Sussex County Trust Company at Franklin, New Jersey, for twenty years. He resigned from this post recently because of the demands of his new duties and responsibilities.

On July 7, 1923, R. L. McCann married Fleta Munson in Franklin, New Jersey. They have two children: Robert, a senior at Lehigh University, and Elizabeth, a sophomore at Beaver College. The family home is in Franklin.

Mr. McCann is an active member of the American Zinc Institute, American Mining Congress, American Institute of Mining and Metallurgical Engineers, and the Newcomen Society. His club affiliations include the University Club and the Wallkill Country Club.



R. L. McCANN

Editorial

Search Your Plant for Scrap

Manly Fleischmann, defense production administrator, has sounded a warning that we do not have a critical problem facing us today that is more important than the job of getting scrap to our steel mills and foundries and to the brass and wire mills. "Unless scrap collections and deliveries increase substantially," he commented, "steel and scrap industry officials predict a cutback in steel production in January and February. We cannot hope to reach our goal of 110 to 112 million ingot tons of steel in 1952 with hit-or-miss scrap collections," he commented.

"Approximately 40% of the nation's brass mill output and more than 40% of aluminum production are earmarked for military requirements in the first half of 1952. The nonferrous industries are faced with a 50,000-ton scrap shortage in the first quarter of the coming year and a pinch in consumer goods is to be expected in the next quarter. The General Services Administration has been authorized to borrow $7,000,000 from the U. S. Treasury to purchase iron and steel scrap from foreign sources. The situation is so serious that it has become a national emergency."

Hand-To-Mouth Operations

We've suffered from scrap shortages before, but the present shortage is the most serious we've ever experienced. Unprecedented steel mill and foundry production schedules to meet greatly expanded military and civilian requirements have out-stripped supplies of iron and steel scrap. Many mills are operating on a hand-to-mouth basis with shutdowns threatened unless they get more scrap. The estimated overall requirements are 3,000 carloads of scrap every day.

Obsolete machinery, equipment, and junk of all kinds littering the yards and premises of mining, quarrying, and construction operations constitute an untapped wealth of scrap metals which have become the lifeblood of our productive effort. Other unused metals common to every plant junk pile are of equally critical importance. Copper and zinc are needed for cartridge cases, aluminum for airplanes, tin for food containers and soldering airplanes. Scrap rubber, Manila rope, burlap, and cotton and woolen rags are also valuable components of the average company's scrap accumulation.

The collection and forwarding of scrap to established dealers are the functions of every industrial plant in the nation, not only to support the increasing steel capacity, but to create a reservoir of scrap sufficient to tide the mills over the winter months when collections ordinarily decrease. Mining companies are especially well equipped to perform with maximum efficiency and effectiveness.

New Pipe-line Construction

During the fourth quarter of this year, the Petroleum Administration for Defense allotted 472,230 tons of steel pipe for the construction of 24 major pipe lines stretching from the Gulf Coast to the industrial East, to speed the movement of petroleum products to the nation's industries and homes. Nine of the new lines are scheduled for completion this year, and 14 of the remaining 15 are expected to be ready for use by the end of the third quarter of 1952. The cost of this new construction program will approximate $800,000,000.

Keeping up with construction schedules in the laying of these 24 major pipe lines, some through many miles of difficult terrain, will require the use of large quantities of industrial explosives. Explosives manufacturers are prepared to furnish the dynamites and blasting accessories needed to help speed the project to completion.

The U. S. Bureau of Mines

On November 10, President Truman announced the appointment of John J. Forbes, chief of the Health and Safety Division of the U. S. Bureau of Mines, as the director of the Bureau to succeed Dr. James Boyd who resigned to enter private industry. The announcement described Mr. Forbes as "one of the world's foremost mine safety experts and an outstanding career employe in the Government Civil Service."

The appointment will be submitted for approval to the U. S. Senate at the next session of the Congress.

A 29-Year Safety Record

The chief inspector of the Bureau of Explosives, Association of American Railroads, reports that during the year 1950 there were no deaths or injuries to persons or property which were chargeable to the rail transportation of industrial explosives. This concluded the 29th consecutive year in which this record has been maintained.

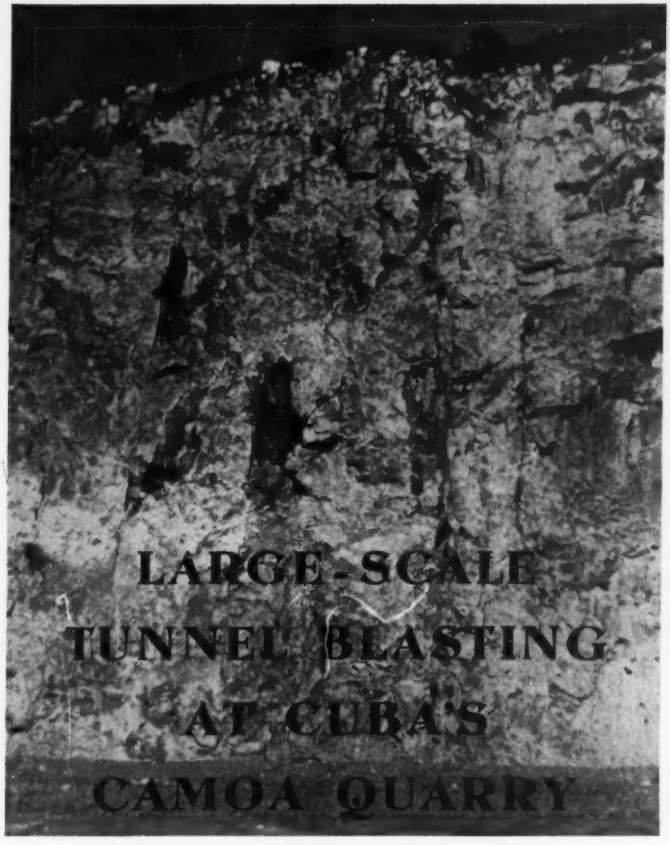
We salute our rail carriers on their magnificent accomplishments in the safe transportation of explosives for industry.

DON'TS

Don't attempt to reclaim or use fuse, blasting caps, electric blasting caps, or any other explosives that have been water-soaked, even if they have dried out. Consult the manufacturer.

Don't permit any paper product used in the packing of explosives to leave your possession. Accumulations of fiberboard cases, paper case liners, cartons, or cartridge paper should be destroyed by burning after they have been carefully examined to make sure that they are empty.

★ A MERRY CHRISTMAS AND A HAPPY NEW YEAR FROM THE EDITORIAL STAFF ★



Tunnel blast Number Three, involving 45,500 pounds of dynamite, was the largest single blast ever made on the Island of Cuba

NELSON WALL*

THE Camoa Quarry owned by the Cía. Pavimentos Construcciones, S. A., and operated under the management of Carlos M. Coroalles, is the largest commercial stone operation on the Island of Cuba. It is located about 36 kilometers east of Havana on the National Highway, near the town of Jamaica in Havana Province. It began doing business in 1898 under the name of the Camoa Quarry Company, and has been in production uninterruptedly ever since. At one time, stone was shipped from its plant to various cities on the Florida coast for construction purposes. Like all operating quarries in Cuba at that time, the work was done by hand.

In 1925, under the management of José L. Roch, the company purchased two 4-cu. yd. steam shovels, three steam locomotives, and fifty dump cars. These acquisitions inaugurated a period of partial mechanization. In 1949, Mr. Coroalles, who succeeded Mr. Roch, decided to install new, modern equipment to mechanize the quarry operations more completely. This modernization program has resulted in a larger tonnage of commercial stone being produced with greater efficiency than ever before.

*Chief Engineer, Barrenos y Equipos de Cuba, S. A., Havana, Cuba.

QUARRY FACE: The formation in the quarry working face is a hard, abrasive, coquina-type limestone in which many open slips and crevices occur.

At present, the principal equipment at Camoa Quarry includes a 2-cu. yd. Lorain Diesel shovel, two 18-ton Mack dump trucks, one H-10 Allis-Chalmers bulldozer, one Gardner-Denver D-99 wagon drill, several Gardner-Denver jackhammers and one 410- and one 120-c.f.m. stationary air compressors.

Tunnel Blasting Adopted

To assist with the mechanization and modernization program, the quarry management called in Barrenos y Equipos de Cuba, S. A., as technical advisors to make recommendations on obtaining increased production of broken stone in the quarry. After careful studies of possible quarrying methods, it was decided that a trial tunnel blast be made, the first on the Island of Cuba.

This first tunnel blast at Camoa Quarry was made in 1950 and the results were satisfactory. Early this year, Mr. Coroalles again called upon Barrenos y Equipos de Cuba, S. A., for consultation and study and a second successful tunnel blast was fired on March 17, 1951. This article summarizes the operating procedures followed in loading and firing the third and largest tunnel blast made at Camoa Quarry under the direction of Barrenos y Equipos de Cuba, S. A.

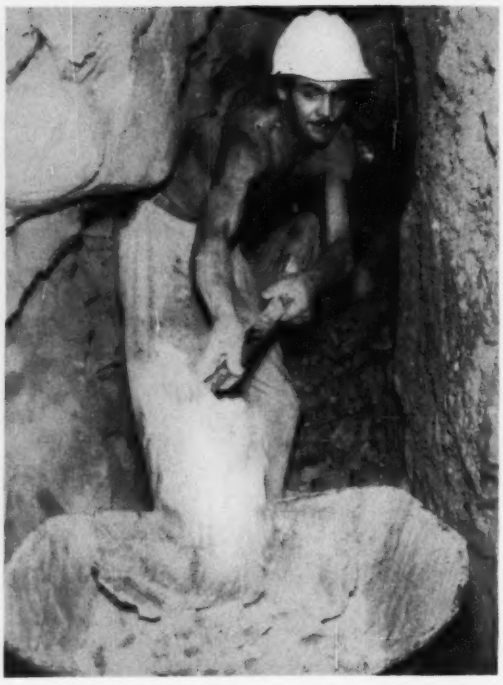
After a transit survey was made of the quarry face and surrounding area, a map was drawn to scale to show the plan and sectional views of the rough and rugged quarry face. From this map, the location of the portal and the length of the tunnel stem and wings were decided upon. Scaling the quarry face above the portal and leveling the quarry floor to grade in front of the proposed tunnel were begun on June 1, 1951.

Hard, Abrasive Limestone

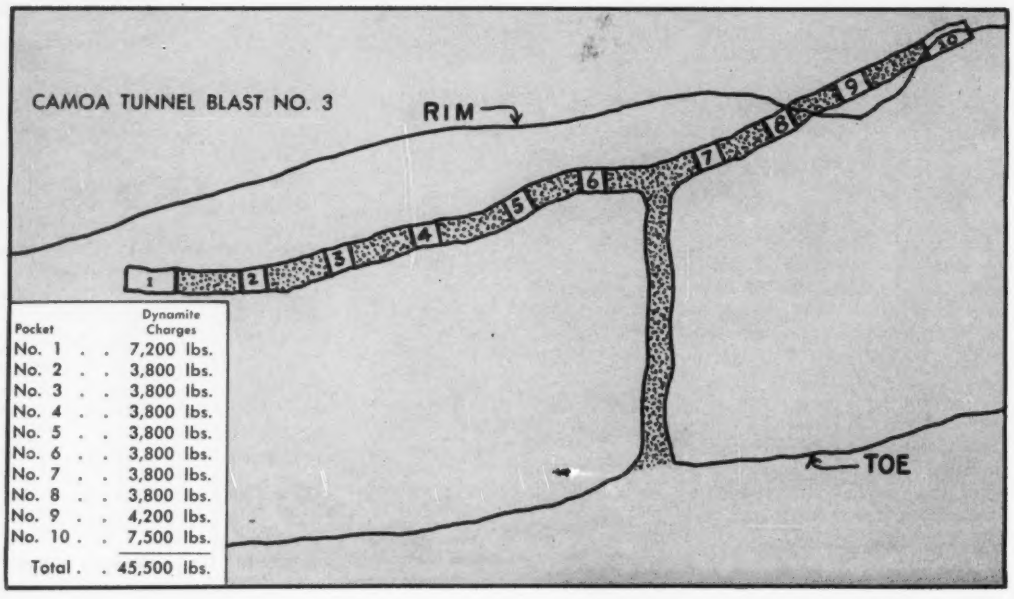
The Rock at the Camoa Quarry working face is a coquina-type limestone composed of marine fossils and shell fragments. Geologists claim that this

(Continued on page 179)

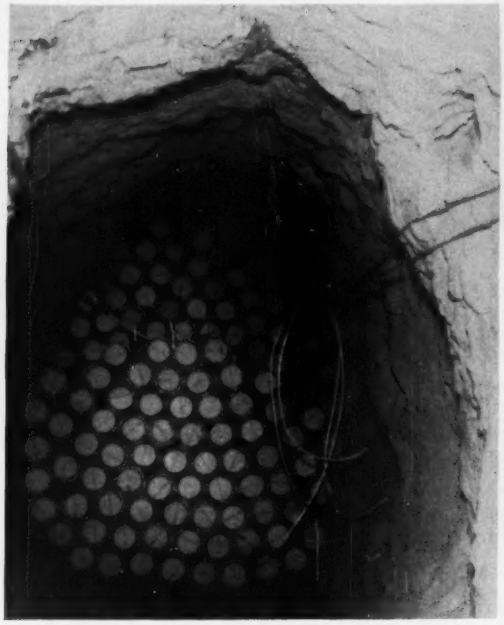
THE LAST ROUND: The drill holes in the final round at the end of the left tunnel wing are loaded and ready to be fired.



MUCKING OUT: One of the crew at work mucking out broken stone after the final blast at the end of the left tunnel wing.



Pocket	Dynamite Charges
No. 1	7,200 lbs.
No. 2	3,800 lbs.
No. 3	3,800 lbs.
No. 4	3,800 lbs.
No. 5	3,800 lbs.
No. 6	3,800 lbs.
No. 7	3,800 lbs.
No. 8	3,800 lbs.
No. 9	4,200 lbs.
No. 10	7,500 lbs.
Total	45,500 lbs.

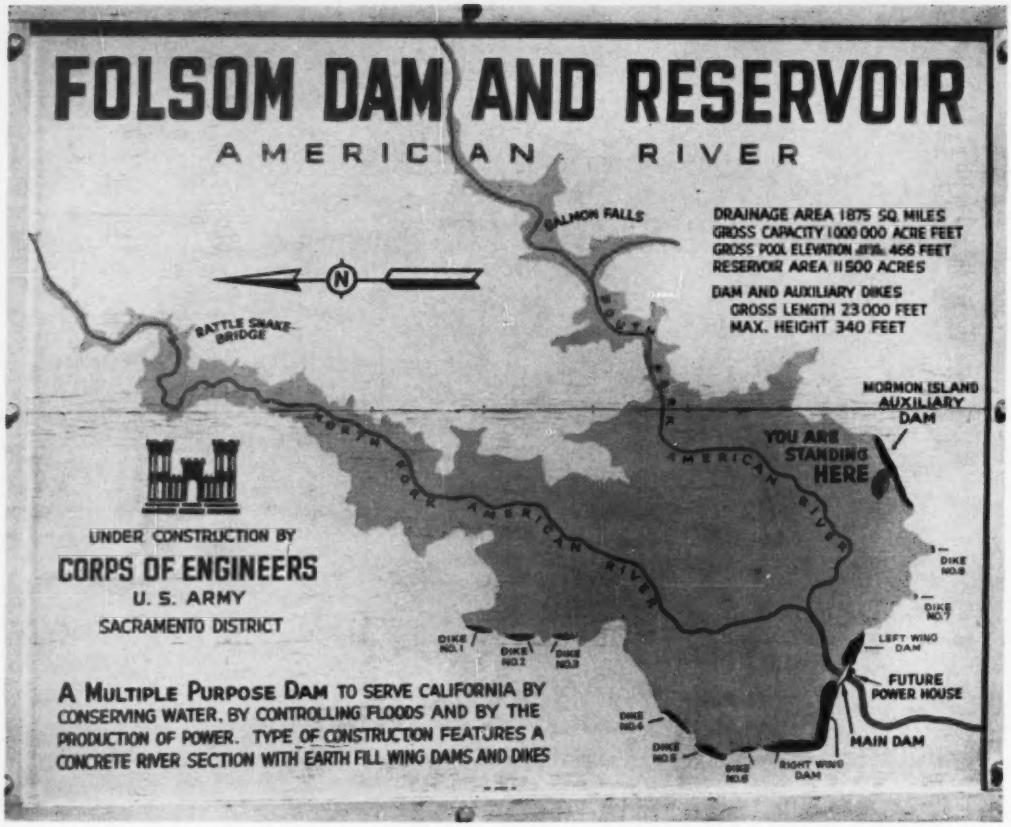


DYNAMITE IN PLACE: A charge of 3,800 pounds of Hercomite dynamite, in 4½ by 24-in. cartridges, has been loaded compactly into No. 2 pocket in the left wing of the tunnel.

PACKAGED SCREENINGS: Stone screenings were packed into heavy kraft paper bags for use as stemming material between the loaded pockets of dynamite in the tunnel.

STEMMING IN PLACE: A close-up of the bags filled and stacked in the tunnel for stemming between the dynamite charges.

AT THE PORTAL: A workman shoveled dry screenings into the portal of the tunnel, preparatory to firing the blast.


FOLSOM DAM AND RESERVOIR
AMERICAN RIVER
SALMON FALLS
DRAINAGE AREA 1875 SQ. MILES
GROSS CAPACITY 1 000 000 ACRE FEET
GROSS POOL ELEVATION 466 FEET
RESERVOIR AREA 11 500 ACRES
DAM AND AUXILIARY DIKES
GROSS LENGTH 23 000 FEET
MAX. HEIGHT 340 FEET
RATTLE SNAKE BRIDGE
MORMON ISLAND AUXILIARY DAM
YOU ARE STANDING HERE
NORTH FORK AMERICAN RIVER
AMERICAN RIVER
UNDER CONSTRUCTION BY
CORPS OF ENGINEERS
U. S. ARMY
SACRAMENTO DISTRICT
DIKE NO. 1
DIKE NO. 2
DIKE NO. 3
DIKE NO. 8
DIKE NO. 7
LEFT WING DAM
FUTURE POWER HOUSE
DIKE NO. 4
DIKE NO. 5
DIKE NO. 6
RIGHT WING DAM
MAIN DAM
A MULTIPLE PURPOSE DAM TO SERVE CALIFORNIA BY CONSERVING WATER, BY CONTROLLING FLOODS AND BY THE PRODUCTION OF POWER. TYPE OF CONSTRUCTION FEATURES A CONCRETE RIVER SECTION WITH EARTH FILL WING DAMS AND DIKES

THE STORY IN A NUTSHELL: This sign erected at the entrance to the project area graphically portrays the location of Folsom Dam and appurtenant structures and the whys and wherefores of its construction.

A review of some of the details involved in constructing the $65,000,000 multiple-purpose dam and appurtenant structures on the American River

ROBERT LEE BEHME*

In the 1860's, prospectors by the thousands came to California's Sacramento Valley in a mad search for gold. They tore up the land, dug out the gold, and vanished, leaving waste behind.

The next major disturbance to the land in the area was caused by the American River. Coming down off the California mountains during the rainy seasons with the force of a powerful explosive, it tore through the unprotected valleys carrying the crops as it went. Many of the old-timers sighed and wished again for the more gentle destruction of the gold miners.

With the completion of Folsom Dam and appurtenant structures, a new and different kind of gold is coming to the Sacramento Valley in the form of controlled irrigation water for the farmers; flood control for the land owners; additional hydroelectric power for all the residents of the valley; and added recreational features for the people of Sacramento and the many smaller Sierra communities.

Several years ago, the Folsom Dam was planned as a section of the United States Bureau of Reclamation's huge Central Valley Project. The plans were filed in the Bureau's headquarters, to await the necessary authority and funds to carry to completion this dream of the California farmers.

Together with the U. S. Army Corps of Engineers, the Bureau realized that much of the foodstuffs of the United States came from the Sacramento and Central Valley of California—grapes, corn, cotton, and wheat. The golden dream of the Central Valley Project has been approaching reality for some

*7471 Melrose Avenue, Hollywood, California.

time and, just recently, water released from Shasta Dam flowed, for the first time, through the extensive canal system of the central and southern portion of the Central Valley Project. Section by section, the Bureau's huge task has been drawing nearer to final completion. While the Folsom Dam is not the final step in this great project, it is one additional link—a link badly needed by the immediately adjacent communities for protection against flood damage and as a reservoir to fill the need for water.

Where the north fork of the American River joins its parent stream, just above California's State Prison at Folsom, the Bureau of Reclamation and the Army Corps of Engineers are supervising the construction of a 65-million-dollar flood control and irrigation dam and hydroelectric power plant project.

Five Contractors on the Job

D and H Construction Company with M. H. Hasler Company of Santa Ana, California, is working on the Mormon Island earth fill auxiliary dam across from the upstream river section. T. E. Connolly, Inc., of San Francisco, is now excavating the inlet and outlet channels preparatory to driving the diversion tunnel through the right abutment of the main Folsom Dam. The Connolly forces recently completed a small diversion tunnel in connection with an earth fill auxiliary dam. H. Earl Parker Company of Marysville, California, is excavating in the right and left abutment sections of the main dam. Downstream, Guy F. Atkinson Company of San Francisco is excavating in the tailrace channel area and the site for the powerhouse. A contract for the construction of the main dam was awarded on August 31, 1951, to a combination of two eastern companies, Savin Construction Corporation of East Hartford, Connecticut, and Merritt-Chapman & Scott Corporation of New York City. Preliminary work on this contract was started in October. All work on the project is under the supervision of the U. S. Army Corps of Engineers.

The diversion tunnel on which the T. E. Connolly crews are working has been designed with an unusually large flow capacity because of the amazing flow range of the American

DRILLING: To avoid shattering the formation at bedrock level, Parker crews drilled holes 12 ft. deep on 4-ft. centers for blasting in the left abutment area.

TYPICAL BLAST: Blasts in the right abutment were loaded with relatively heavy charges of dynamite to compensate for loss of energy through seams in the decomposed formation.

AFTER A BLAST: A 2-cu. yd. Northwest 80D power shovel was put to work by the Parker Company forces to excavate and load out blasted material in the south end.

JOB INSPECTION: H. Earl Parker Company supervisors, left to right, Erwin Poston, shift foreman; Al Wear, powder foreman; and Ed Bell, general superintendent.

River. During the dry months between May and December, the river has an average flow of about 200 cu. ft. a second. When the rainy season takes over and the snows melt in the spring, it has been known to flash to over 200,000 cu. ft. a second. Because of the predictable, but uncertain, flow range, the Army Engineers have designed the diversion tunnel to carry 12,000 cu. ft. a second as a safety margin during the dry season.

The Connolly Operations

The T. E. Connolly, Inc., workmen are excavating in the inlet and outlet channel areas for the diversion tunnel. Excavation in the tunnel has not begun as yet. The upstream portal of the tunnel is about ¼ mile above the abutments. The tunnel will bore under the right abutment about 50 ft. below the estimated final abutment excavation. While construction is under way, the portals of the tunnel are protected from the river by dikes which are high enough to provide flood-level safety. The downstream end of the tunnel will also require an earth fill dike to protect the workmen. After the tunnel is completed, the main dam contractor will remove the dikes and divert the stream into the tunnel, and build two cofferdams across the river bed behind the tunnel openings. Water will be pumped out of the river bed between the cofferdams while the work on the dam foundation is in progress. When the main dam is completed, the tunnel will be plugged and the river water redirected into the channel.

Connollys crews are making initial excavations at a point about ½ mile south of the highway and the Army Engineers' office. At the time of the writer's visit, the portal cut was about halfway to final depth. The completed portal, which will measure 93 ft. in depth and 225 ft. in length, will require about a 200-ft. top width cut. The cut will be carried on a 1-to-1 slope to a required width of 25 ft. at the invert grade.

The Connolly Company forces are loading material from the pit with a 2¼-cu. yd. 80D Northwest shovel. Three end-dump Euclids and four 24-cu. yd. rock-bodied trucks are loaded by the shovel operator under the direction of a spotter who directs

the movement of all the vehicles, for more efficient operation.

Drilling and Blasting

The material in the portal excavations varies from disintegrated granite intermixed with large granite boulders to solid granite. Drilling operations in the cut are being carried out with 12 Ingersoll-Rand DA-30's and eight Gardner-Denver jackhammers, plus a 30 Caterpillar jumbo with a bar mounted on the back holding four DA-30 Ingersoll-Rand drifters. The Caterpillar jumbo setup accounts for 1,500 to 2,000 ft. of vertical holes per shift. Approximately 150 holes on 4-ft. centers are drilled on every lift. The holes are 12 ft. deep and 1⅞ in. in diameter. The drills are equipped with Crucible steel and Ingersoll-Rand series 113 and 115 insert bits.

After a round is drilled, the holes are loaded with Hercomite* 2 dynamite on a ratio of ¾ to 1 lb. to 1 cu. yd. of material in place. The charges are primed with Hercules* Electric Blasting Caps. The top three feet of each hole are stemmed with drill cuttings. When ready to blast, the cap leg wires are connected in parallel series and the charges are detonated from a 220-volt station located about 200 yds. above the cut. An average of two blasts is fired every 24 hours. Each blast yields from 350 to 450 cu. yds. of broken material. Approximately 1/3 of the fractured formations has to be reblasted because of the many seams and boulders that have to be contended with.

*Reg. U. S. Pat. Off.

"HOW ABOUT THIS?": Charles Ray, project superintendent on the Connolly contract, discusses with his blasting foreman the loading of dynamite in bad-breaking ground.

Air for the drills is supplied by an 1,800-c.f.m. Ingersoll-Rand stationary compressor which is installed on a hill directly above the working area. The compressed air is piped to the drills in standard galvanized tubing.

Connolly's crews are working only a short distance from H. Earl Parker Company's crews, and both companies dump spoil material in a joint fill area. The fill is providing riprap for the riverbank above the dam.

The Connolly Company operations are directed by Earl Walsh, project manager, assisted by Charles Ray, project superintendent, and Joe Barnett, project engineer. Mark Foster is master mechanic on this job, and Joe Brown, Brandy Hall, and Tex Durham are the walkers.

H. Earl Parker Company

About ¼ of a mile downstream, the H. Earl Parker Company workers are excavating in the right abutment area. The primary excavation in connection with the right and left abutments was completed last year, by Hawley & Ramlose and Hawley Construction Company of Los Angeles, under a contract with the Army Engineers. This contract consisted of excavating and removing approximately 240,000 cu. yds of material. Starting operations in February, 1951, under a new contract, the Parker crews are busy

(Continued on page 183)

WET GOING: Some of the workmen on the Atkinson contract had to stand in two inches of water while operating wagon drills ½ mile downstream.

Skillful Blasting Demolishes Huge Reinforced-Concrete Structures

A brief summary of the details involved in a demolition project in South Weymouth, Massachusetts

CHARLES RICHARD*

THE HANGAR: The Navy's hangar in South Weymouth, Massachusetts, built in 1942, was 1,090 ft. long, 220 ft. wide, and 180 ft. high, the largest wooden suspension building in the world.

THE U. S. NAVY's decision to remove a dirigible hangar 1,090 ft. long, 220 ft. wide, and 180 ft. high, at its base in South Weymouth, Massachusetts, set the stage for a local contractor to demonstrate the economy and efficiency of blasting with industrial explosives on demolition projects.

In accord with its expansion program, Navy officials found it necessary to remove the hangar to make way for runways to accommodate the modern type of jet aircraft to be based at the South Weymouth airfield. The hangar, built in 1942, was the largest wooden suspension building in the world. It was faced at both ends with huge structures of reinforced concrete and steel. The job of removing these structures was awarded to Uriel O. MacDonald, a contractor of Braintree, Massachusetts, who specializes in drilling and blasting.

Job Requirements

The first work done on the contract was at the south end of the hangar, involving the removal of four reinforced-concrete pillars, each 20 by 20 by 180 ft., weighing 500 tons a pillar. The pillars supported a box beam across the top, of the same material, weighing 300 tons. Within this mass of concrete were six overlapping steel and asbestos doors, each 3 ft. thick, and each weighing 72 tons. The entire structure to be removed represented a total weight of about 2,800 tons.

The contractor's crew moved onto the job and, using an Ingersoll-Rand wagon drill equipped with a J-50 hammer, drilled 380 holes in the front part of the pillars. They were located 15 ft. above another series of drill holes in the back part of the pillars. This was done to direct the fall of the structure forward when the blast was fired. In addition to the 380 holes, a series of longer length holes was drilled, extending into the structure from a height of 3 ft. in the rear to 16 ft. in the front. Drilling operations were completed in one week.

The First Blast

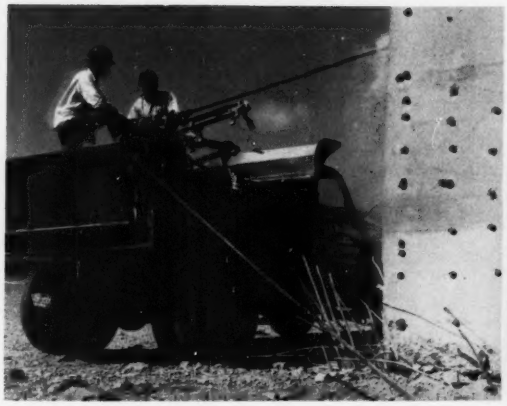
Each long hole was loaded with ten cartridges of Hercules† Dynamite, 1¼ by 8 in., and each short hole with ⅔ of a cartridge. Total dynamite loaded was 525 pounds. The dynamite in each hole was primed with a Hercules† Electric Blasting Cap.

When the "all clear" signal was given, the contractor fired the blast and the massive structure heaved forward and tumbled toward the earth in a great cloud of dust. After the atmosphere had cleared, a huge mass of broken and twisted steel and concrete was deposited on the ground away from the hangar.

The Second Blast

The contractor's second assignment called for drilling and blasting the concrete pillars, the box beam across the top, and the doors at the north end of the hangar. The total weight of these units was 2,300 tons. Holes were drilled, loaded, and fired in the same manner as on the first assignment, using similar equipment and materials. The second blast, involving 475 pounds of Hercules Dynamite, was another successful accomplishment by Mr. MacDonald in a series of projects requiring precision blasting with industrial explosives. It moved the huge pillars, cross beam, and doors out and away from the hangar, to come tumbling down onto the ground, a twisted and broken mass of wreckage. The debris was removed by Fellsway Wrecking Company.

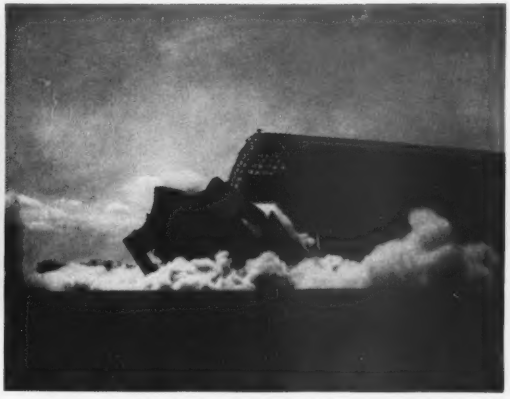
*28 Commercial Street, East Braintree 84, Mass.
†Reg. U. S. Pat. Off.



LEFT: Using a wagon drill equipped with a J-50 pneumatic hammer, a two-man crew drilled holes into the concrete structure.

RIGHT: After the series of holes was drilled, the blasting crew loaded them with carefully calculated charges of dynamite.

LEFT: A close-up of the south end of the hangar soon after the blast of 525 lbs. of dynamite had been detonated.



RIGHT: Another view of the blast of the concrete-and-steel structure weighing 2,800 tons, midway in its fall to the ground.

LEFT: When the dust had settled, the spectators moved in for a look at the heaped-up wreckage in front of the hangar.

RIGHT: This view of the south end of the hangar after the blast shows the interior of the wooden suspension building.

ROGERS CITY QUARRY WINS NATIONAL SAFETY HONORS

Michigan Limestone & Chemical Company's quarry employes win the Sentinels of Safety trophy with a record of 1,273,376 man-hours of work in 1950 without a lost-time accident

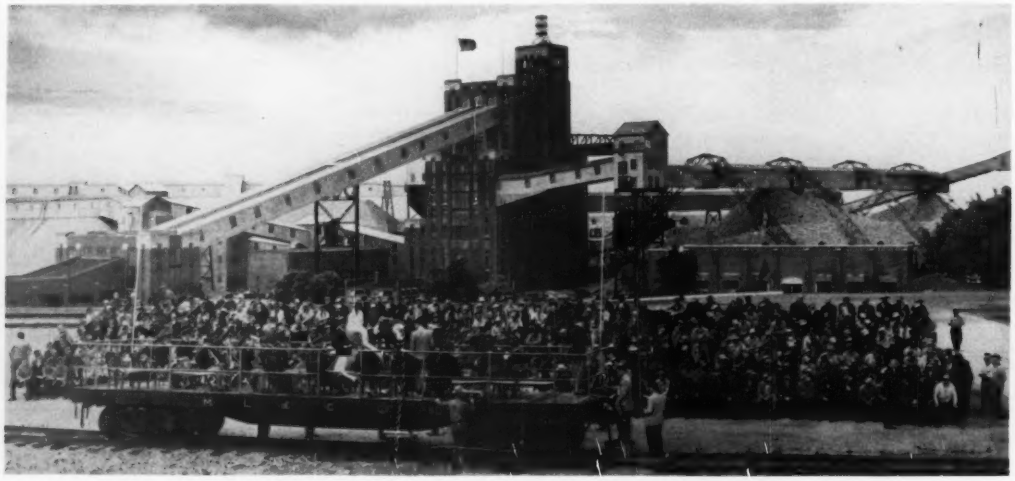
MICHIGAN LIMESTONE & CHEMICAL COMPANY'S limestone quarry at Rogers City, Michigan, was operated for a total of 1,273,376 man-hours during 1950 with no disabling injuries. This remarkable accident-free record won top safety honors in a group of 211 quarries enrolled in the National Safety Competition of 1950.

Officials of the company paid tribute to their victorious quarrymen in ceremonies at the Rogers City property on July 19. Bleacher seats were erected in the area between the crusher house and the machine shop, and a railroad flat car, decorated with red, white, and blue bunting and the Sentinels of Safety flag, was utilized as a speakers' platform and bandstand. As the quarry and plant employes were finding seats in the bleachers and the speakers were taking their places on the stand, the Rogers City band entertained with a half-hour concert.

Flag Raising Opens Program

The ceremonies were opened with the raising of Old Glory and the Sentinels of Safety flag, after which Joseph A. Valentin, manager of operations, Calcite Division, extended congratulations to the winning quarrymen from everyone associated with the Rogers City operation.

Mr. Valentin introduced John A. Johnson, district engineer for the U. S. Bureau of Mines, as the first speaker. Mr. Johnson complimented each man in the quarry organization on the impressive safety record made by the group in 1950. He explained how the National Safety Competition was conducted by the Bureau in Washington, and told of the significance of the Sentinels of Safety trophy and flag in the contest. "There were 566 mineral operations in the United States entered in the 1950 competition. Of these 566 enrolled contestants, 172 reported no lost-time injuries. This represented a total of 16½ million man-hours of work. In your group, 211 quarries were entered in the contest



CEREMONIES BEGIN: When the employes were seated in the bleachers and the speakers had taken their places on the improvised stand, the program was opened with the raising of the flags.

JOSEPH A. VALENTIN: The manager of operations of the Calcite Division extends congratulations to his quarry associates from everyone in the local organization.

TROPHY AWARDED: John A. Johnson, right, representing the U. S. Bureau of Mines and The Explosives Engineer, awards the Sentinels of Safety trophy and flag to George R. Jones, safety director, Calcite Division, representing the employes.

and 111 of them had perfect safety records. You men, with a record of having working 1,273,376 man-hours without a disabling accident, easily won the top honors.

"In your 23-year history in these annual nationwide safety competitions you have won first honors and the Sentinels of Safety trophy five times—in 1929, 1932, 1933, 1934, and 1950. Again I want to congratulate you on your splendid achievements."

Presentation of Trophy

At the conclusion of his remarks, Mr. Johnson presented the Sentinels of Safety trophy and flag to George R. Jones, safety director of the company's Calcite Division, as the representative of the local quarry employes. In accepting the awards, Mr. Jones expressed the pride and pleasure of the Rogers City quarrymen in receiving such outstanding awards in a nationwide safety contest.

Brief addresses were made by officials of the company, including Irvin L. Clymer, president; H. S. Lewis, vice president, operations; and C. F. Platz, vice president, sales. Among other things, President Clymer expressed a desire to spend more time at Rogers City "where my fellow-employes of many years are continuing to do a good job at making safety and production records. My congratulations to you all. I wish for you many more successful years in your accident-prevention work." Mr. Lewis remarked that he hoped "our quarry operators will keep on making records in safety on the job. If you continue to make safety an important item in each day's work, the records will take care of themselves." Mr. Platz said he "was not surprised when the Rogers City employes made such a remarkable safety record last year. It has long been a habit with this group of quarrymen to always come through on any worthwhile project."

IRVIN L. CLYMER: The president of the company told his fellow employes of many years, "We're all proud of you men who continue to make safety and production records."

STEPHEN D. BECHTEL

CHARLES B. SPENCER

The MOLES AWARDS FOR 1952

Stephen D. Bechtel and Charles B. Spencer to be honored at the twelfth annual dinner-meeting of The Moles for outstanding contributions to construction progress

When members and guests of The Moles, a New York association of tunnel and heavy-construction men, assemble for their twelfth annual dinner-meeting in the Waldorf-Astoria hotel February 6, The Moles Awards for 1952 will be officially presented to Stephen D. Bechtel, president of The Bechtel Corporation, San Francisco, and to Charles B. Spencer, president of Spencer, White & Prentis, Incorporated, New York. A recent announcement by George Ferris, vice president and general manager of Raymond Concrete Pile Company, New York, and chairman of the association's award committee stated that Mr. Bechtel, a nonmember, and Mr. Spencer, a member, were chosen because of their outstanding contributions to construction progress. Reservations received to date for the dinner-meeting indicate that more than 1,000 prominent contractors, engineers, and manufacturers' representatives will be in attendance.

Stephen D. Bechtel

During summer vacation months, Stephen D. Bechtel learned the fundamentals of the construction industry on various assignments with W. A. Bechtel Company, his father's organization. Following his return from service overseas with the U. S. Army Corps of Engineers in World War I, he was graduated from the University of California in 1923, with a B.S. degree in civil engineering. Later, during the construction of Hoover Dam, Mr. Bechtel was a director and a member of the executive committee of Six Companies. On the east crossing for the San Francisco Bay bridge, his company was associated with Bridge Builders, Inc., on the construction of piers. The firm was also one of a group of contractors that carried on pre-World War II defense construction on Wake, Midway, Guam, Johnston, and the Hawaiian Islands.

During World War II, the Bechtel company built numerous industrial plants, refineries, air bases, and a section of the Big Inch pipe line that carried oil from Texas to the eastern

(Continued on page 187)

CAMOA QUARRY

(Continued from page 169)

particular rock mass resulted from an upheaval of the ocean floor which occurred during the formation period of the island. The limestone is rather hard and somewhat abrasive. Because of the latter condition, carbide insert drill bits were used during most of the time when the tunnel stem and wings were driven. The large hill which forms the quarry face, somewhat resembling a precipice, is cut by a series of slips that run in all directions. Some of the slips are open and form crevices and caves; others are recemented with calcite crystals or are filled with a sticky red mud. Drilling operations in this type of limestone are difficult.

The rounds for blasting in the tunnel stem and wings were drilled with column-mounted Gardner-Denver drills and 1-in. hexagonal drill steel equipped with either Timken detachable or Timken carbide insert bits. A 10-hole drill round was used to drive the tunnel. Each hole was loaded with 1 by 8-in. cartridges of Gelamite* 2X, and the charges were fired with blasting cap and safety fuse. About 4 ft. of tunnel advance were obtained from each blast. The blasted rock was hand-loaded into wheelbarrows and transported through the tunnel to the outside.

Tunnel Dimensions

Quarry production was maintained while the tunnel was being driven—wagon drill and secondary blasting operations were carried on in other parts of the quarry. The time required to drive the tunnel was approximately 60 days—it was completed September 8, 1951. The stem of the tunnel was 19.0 meters deep, the left wing was 35.0 meters long, and the right wing was 21.5 meters long. It was decided to use Hercomite* X dynamite in 4½ by 24-in. cartridges in the blast and to load the dynamite in ten pockets in the tunnel wings.

To detonate the charges in the tunnel, four strands of Reinforced Primacord were placed in the stem and wings of the tunnel before the dynamite-loading operations began—two strands on each side supported by hooks affixed in the sides of the tunnel. The loading of the explosives began at 7:30 p.m. Wednesday, September 12, 1951. The pockets in the wings were loaded according to a prearranged schedule, and one 50-lb. case of Gelamite 1-X dynamite was used as a primer in the charge in each pocket. A total of 45,500 lbs. of dynamite was used, and the pockets were loaded as shown in the accompanying diagram. The area between the pockets of dynamite in the wings and all of the stem of the tunnel was filled solidly with heavy kraft paper bags containing stone screenings. Approximately 20,000 of these bags were used to take care of this stemming requirement.

*Reg. U. S. Pat. Off.

EXCELLENT FRAGMENTATION: This photograph taken at one end of the pile of broken limestone after the tunnel blast is representative of the excellent fragmentation obtained.

Loading the Tunnel

The work of loading the dynamite into the pockets and the stemming activities were continued around the clock. The following working cycle was followed: one man was stationed in each of the two tunnel wings to load the explosives or the stemming as required; three men handled the wheelbarrow details; two men opened dynamite cases; two men filled bags with stemming; one foreman supervised the work of the crew; and the author was in charge of overall operations. The loading time for placing an explosives charge in a pocket averaged 1½ hours.

At 8:30 Saturday morning, September 15, 1951, the tunnel was loaded and stemmed, representing a total working time of 62 hours.

Results Excellent

Just before it was time to fire the blast, the four strands of Reinforced Primacord extending from the tunnel portal were tied to a single cross-strand of Primacord, and the lead wires were strung. When everything was in readiness for firing the blast, two No. 6 Electric Blasting Caps with 6-ft. leg wires were taped to the cross-strand of Primacord, one at each end. The caps were hooked up in series and connected to the lead wires and the blast was fired at 3:25 p.m. with a Hercules 50-Cap Blasting Machine.

The blast described above was the largest single blast fired to date on the Island of Cuba. It was a success in every detail. A total of 125,000 cu. yds. of well-broken stone was brought down upon the quarry floor.

TALES OF A GOLD MINER IN NICARAGUA

By C. CARLETON SEMPLE*

Some rambling recollections of mining operations under peacetime and wartime adversities

CONCLUSION

A FORM of ringworm of the feet, known more familiarly as athlete's foot, is prevalent in underground workings. It is spread in the change room, and the floors there should be disinfected daily with a solution of boiling water and Creolin Pearson or Lysol, or with a 5-per cent solution of formalin in a small amount of any soap powder in hot water. For treatment of the sores, I tried several formulas, one of which was a mixture of talcum powder and from 1/5 to 1 per cent of oxyquinoline benzoate. Equal quantities of borax, boric acid, sodium perborate, sodium bicarbonate, zinc stearate, and zinc peroxide were added to this mixture in any combination up to a total of 19 per cent, with the talcum powder comprising 80 per cent and the benzoate 1 per cent. Such a powder can be issued to the miners in small envelopes, for them to apply themselves. It is rubbed into the infected feet and sprinkled into shoes and socks. It cannot possibly be misused, to cause any harmful results.

To properly treat eye injuries or infections, the wisest course is to send the first-aid crew to an eye specialist for a few days' training and instruction, even though he may reside a three-day journey from camp.

*Director, Empresa Zopel, Apartado 552, San Jose, Costa Rica.

First-aid rules always mention the use of oil in the eye for relief from irritation caused by gritty substances. For this purpose a few drops of castor oil, olive oil, linseed oil, and similar oils have been recommended. Whatever treatment is resorted to, all solutions should be sterile, and every instrument used should be sterilized. The final treatment should consist of a few drops of a 20-per cent solution of Argyrol. One or two applications of these drops usually will clear up all cases of pink eye, a very common occurrence in some places, even where there is no hydrogen sulphide in the water or in the mine atmosphere. It is excellent as an eye antiseptic and relieves almost all irritations.

Earache and toothache are constant plagues. Until either ache can be properly attended to by a doctor or a dentist, it is advisable to have a physician prescribe a supply of drops for the first-aid kit. Regardless of the condition of aching ears or teeth, the cause may be malaria.

Mosquitoes and Flies

It is practically impossible for small industrial concerns to take extensive measures to eradicate the causes of most endemic diseases. In combating mosquitoes, about all that can be done is to use every available means to prevent them from becoming infected by contact with a person suffering from malaria or other similar diseases. Conversely, efforts should be made to prevent persons from coming into contact with infected mosquitoes. Screens are effective, provided they are placed and used properly. Mosquitoes are most active at night, and beds in sleeping quarters should be protected by hanging cloth mosquito bars that reach to the floor in loose folds. They should be let down well before dark and sprayed inside and outside, both at dusk and in the morning. More effective than the hanging cloth mosquito bar is a light wooden frame to enclose the bed. It should reach from the floor to a height of about 8 ft. and be provided with a door. The frame should be covered with very fine mesh wire to become, in effect, a small room, with walls and ceilings of screen wire. It is much cooler than the conventional mosquito bar. Out of doors, protection may be obtained by various effective lotions and ointments that may be bought in bulk at low prices.

Flies are much more difficult to control. The usual 5- and 10-per cent solutions of DDT are effective if used on warm white surfaces, especially when the sun is shining on them.

Roaches and Fleas

Roaches are hard to kill. Before the war, sodium fluoride or silico-fluoride powders were the most effective means of control. But the use of DDT eliminates them completely. Not only walls and ceilings, but floors should be coated. Window and door frames should be sprayed with a 10-per cent solution.

Another infestation that is prevalent in these countries is the chigoe, or chigger flea, that burrows into one's toes, causing painful results. The fleas may be removed with a sterile needle, much like taking out a splinter. A solution of potassium permanganate is applied as a disinfectant. If shoes become infested, a few balls of naphthalene should be left in them overnight. In camps where the floors are bare soil or wood, an abundant spray with 10-per cent DDT may be used. If neglected, the infestation, both of the feet and the floors, may become very serious.

Fleas are controlled effectively by DDT preparations, preferably in powder form. Kerosene, sulphur, and naphthalene are also effective, but special powders, such as Pulvex, should be used on animals. Shake the powder well into the hair between the shoulders of cats and dogs, and onto the places where they sleep. The powders may be rubbed on human ankles and legs, for fleas generally climb up from floors.

Ticks and mites, or similar very small creatures bright red in color, are only slightly affected by DDT preparations. Not only are they carriers of serious diseases, but they may be very painful. A bath from the waist down in hot water with plenty of soap and Lysol or Creolin Pearson is effective in removing them and in keeping them off. Care should be taken not to rinse off the water, rather let it dry from contact with the air or use a towel lightly. These little animals rarely bother a person above the waistline. Their bites become infected easily even though the animals have been removed. Nowadays, an ointment of penicillin is effective for taking care of such infections.

Ants and Rats

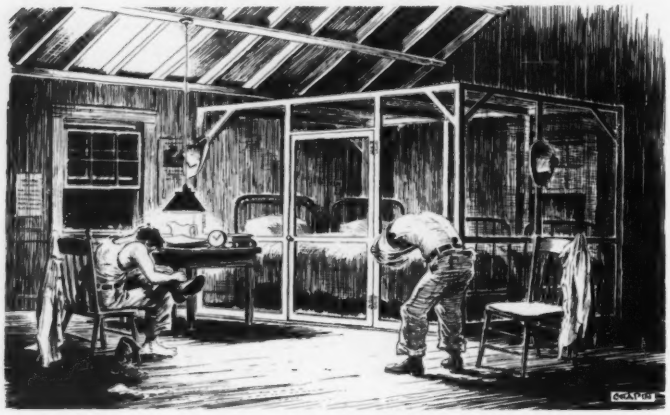
The control of ants may be carried to complete elimination by painting doors and windows with DDT. Also, preparations of sweetened thallium sulfate or sodium arsenite, placed in small tins that are covered and punctured with holes through which the ants can enter, are useful. The effect is not to kill them immediately, but after contact they return to their nests and die. At the same time, they carry death to others in the nests. For outdoor ants that infest gardens, carbon tetrachloride may be poured into openings that lead to the nests. Cyanogas may also be used.

Rats carry disease and are infested with disease-carrying insects. They are apt to multiply to great numbers in and around mine workings. They gain access to warehouses and destroy stored materials, not necessarily food supplies. No one method is sufficient for their control or elimination. Rats must be combated with every variety of exterminant that can be found. Most older rats resist offers of poisoned food unless made incautious by exposing to them a harmless food that later is to be mixed with poison. Fish seems to be one of the baits that are least resistible. It may be poisoned with barium carbonate, antu, red squill, phosphorous, and arsenical preparations. Finally, keep plenty of well-fed cats around. Contrary to popular opinion, cats do not hunt for food as such but for the sport of the hunt. If hungry, they will permit rats to run over them; if well nourished, they will prowl about during the night hours and eliminate not only rats, mice, and rabbits, but any of the smaller animals that move.

Fumigating Native Houses

Whenever changes of occupants occur in mining camps, it is necessary to fumigate the native houses. This is also done whenever sanitary inspections indicate the need. While cyano-

gen is an effective agent, it is too dangerous to place in inexpert hands. "Heavy" gasoline is too apt to cause a fire. To do the job properly, fumigation calls for exposure for several hours, sometimes for an entire day. A fairly tight enclosure is a requisite. Sulphur may be bought in prepared blocks or candles. In powder form, it may be mixed with a small amount of potassium or sodium nitrate and placed in paper bags. The bags are suspended by string over a small charcoal fire in a pan. The pan is surrounded by water in a much larger container to avoid fire. The string is made fast near the door. When all is made ready, the string is cut and the bag falls upon the hot coals. Eight pounds of sulphur are required per 1,000 cu. ft. of enclosure, with not less than 10 hours of exposure. This should be repeated the following day if bedbugs or similar insects are to be eliminated.



The frame is, in effect, a small room with walls and ceiling of screen wire. It is much cooler than the conventional mosquito bar.

Horses and Mules

At mines where horses and mules are used, care should be exercised to relieve them from the sufferings that come from ticks and many varieties of biting flies. There are zones where large flies abound and, in a few minutes, they will cover an animal with so many bites that in passing one's hand over the flank, the neck, or the rump, the hand will become covered with blood. Ticks can be smothered so that they will drop off or die from applications of heavy grease preparations of kerosene, cresols, or any of the various sheep dips. The same insect repellents that are effective on human beings will also protect animals. For treating sore backs of horses and mules caused by saddles, pack-saddles, or anything that results in a skin abrasion, a dusting powder may be used, such as calomel, or a mixture of calomel and an equal weight of bismuth subnitrate. Also, a combination of equal parts of the aforesaid two substances and zinc stearate is useful.

Books and Papers

All untreated wood surfaces promote the growth of molds, probably because of the ease with which they absorb moisture. Books of accounts, office records, maps, and other desirable papers should be stored in steel cabinets or in concrete vaults that are finished with a moisture-impervious surface and are well ventilated.

Furniture and Clothing

Household furniture made of metal is unquestionably preferable. Unpainted or unfinished interiors of household furniture such as wardrobes, closets, bureaus, bookcases, trunks, suitcases, chests, and other articles of furniture can be improved by some protective coating. My personal preference is for aluminum paint, and "millboard" enamel for the inside surfaces, except on suitcases. An insecticide may be incorporated with the paint if compatible. Usually it is more effective to apply the insecticide separately.

Clothing should be thoroughly dried and ventilated before placing in a closed space. For further protection against mold, a heating element should be introduced. If electric current is available, use a 40-watt lamp in a cleat receptacle screwed to the bottom board, protected by a standard wire lamp guard to keep clothing from being burned.

Bookcases should be heated in a manner similar to wardrobes. It is easy to adapt a standard wire heating coil in them, to run across the entire back just beneath the lowest shelf. The shelves should not extend all the way to the back. Books, loose-leaf file covers, whether of real or artificial leather, may be protected from mold by a coating of shellac. For the protection of leather goods such as shoes, luggage, saddles, belting, etc., the U. S. Army Quartermaster's Department uses cyclohexanone (practical) 10 per cent, para-nitrophenol (technical) 2 per cent, neatsfoot oil 10 per cent, mineral oil 10 per cent, tetrachlorethylene (technical) 68 per cent.

Production Beyond Expectations

A mining company entirely dependdent upon a single property, no matter how prosperous it may be temporarily, is like a farm with undiversified crops, or a small country dependent upon a single exportable product. Experience has led companies that operate immense deposits and treat thousands of tons daily to recognize this as an axiom of the mining business. In the case of miniscule deposits, failure to realize this fact is amateurish. In our case, the specific goal had been attained in two years. Expectations had been exceeded and production had continued at a modest profit for two years longer than had been anticipated. It marked the only time in the 135-year history of the district that such an achievement had been accomplished.

THE END

FOLSOM DAM

(Continued from page 173)

on additional abutment excavation with a Northwest 80D shovel. The overburden extended only 15 ft. below the original 20 ft. excavated by Hawley & Ramlose. Since that time, the material excavated has been somewhat similar to that found on Connolly's job.

The final elevation of the left and right abutments will be at 270. This will require the excavation of 115 ft. on the back end of the right abutment, tapering to about 75 ft. at the river. The left abutment will reach a depth of about 96 ft. at the back end, dropping to about 75 ft. nearer the river. Both abutments will average 145 ft. in width and 450 ft. in length. The back slopes will be 1 to 1. Penstocks will be installed on the right abutment only. After the right abutment is down to barring and wedging distance of the final grade, operations will be shifted to the left abutment.

Difficult Blasting Problems

As on the Connolly cut, the material on the Parker contract comprises granite boulders interspersed in decomposed granite. This poses difficult blasting problems. At the proposed barring and wedging level, bedrock must be solid. To keep from shattering the bedrock, the crews are drilling and blasting in highly controlled 10 to 12-ft. lifts. From 100 to 150 holes, 12 ft. deep on 4-ft. centers, are drilled in each lift. The equipment includes six wagon drills, four Sullivan 55's and two Gardner-Denver 573's, equipped with 1-in. hexagon steel and ⅞-in. Timken carbide bits. Air for the drills is supplied by four compressors—two Gardner-Denver 365's, one Gardner-Denver 500, and a 600 Ingersoll-Rand.

The drill holes are loaded with Hercomite 3 and Gelamite* 1 dynamites, the grade used depending upon the kind of material in each lift. The dynamite cartridges, 1¼ by 8 in. in size, are loaded on a powder factor of ⅝ to ¾ lbs. per cu. yd. of solid material. The charges are primed with Hercules Electric Blasting Caps and the holes are stemmed with 3 ft. of drill cuttings. In firing a blast, the cap leg wires are connected in series-parallel and the charges are detonated from a 220-volt mobile light plant. This mobile light plant also provides illumination during night working hours.

*Reg. U. S. Pat. Off.

DOWNSTREAM: On the second lift in the lower section of the tailrace channel, Atkinson operators had to contend with more serious water conditions.

AIR FOR THE DRILLS: A battery of compressors supplied air for heavy-duty wagon drills on the downstream section of the Atkinson contract.

After blasts are fired, a 2-cu. yd. Northwest 80D power shovel is put to work to excavate and load out the material from the abutment excavation pit into three 14-cu. yd. Euclids and two 22-cu. yd. rock-bodied trucks. The trucks have a fairly level haul of about 120 yds. to the dump area, where the spoil material is forming the riprap on the upstream section of the riverbank. This fill area will be used later by the Connolly workmen as an access road.

H. Earl Parker Company's supervisory personnel includes Ed Bell, general superintendent, Charles de St. Maurice, project engineer; Al Wear, drilling and blasting foreman; and Erwin Poston and George McFadden, shift foremen.

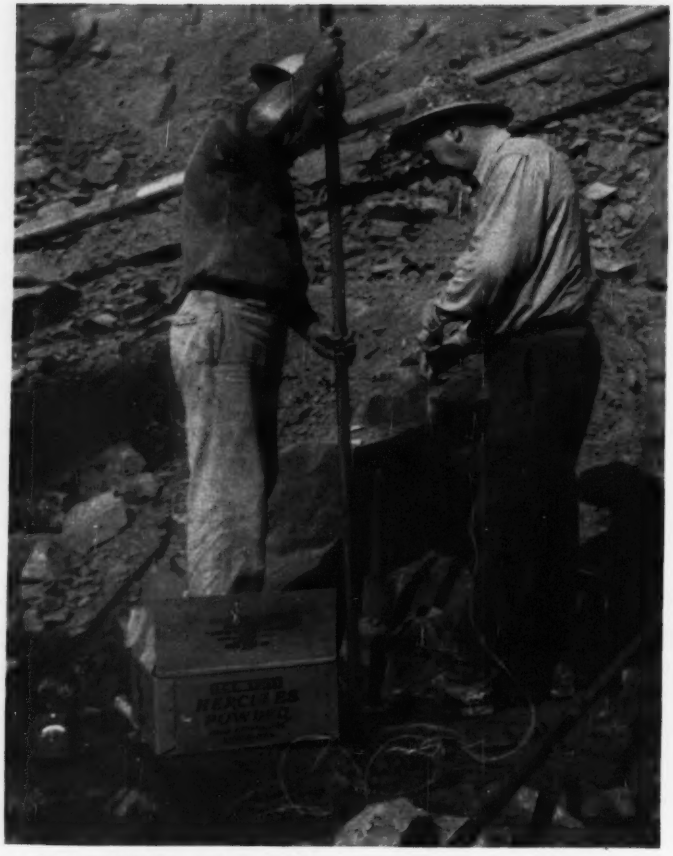
Guy F. Atkinson Company

Downstream from Parker's crews, Guy F. Atkinson Company workmen are busy excavating for the powerhouse site. Work has been temporarily suspended at this location as the excavation has reached the halfway point. Atkinson's crews are now concentrating on the tailrace channel

excavations about 1 mile downstream from the powerhouse site.

A. H. Steiner, project manager and engineer on the Atkinson contract, found that during the dry season the flow, of the stream was efficiently checked by an upstream dam owned by Pacific Gas & Electric Company. Any water left in the river bed downstream of this existing old rubble-stone masonry dam is pumped up into the P. G. & E. ditch, located on the left bank of the American River some 60 to 70 ft. above and paralleling the tailrace channel to be excavated. The work in the tailrace channel is divided into two sections: the upper section, near the P. G. & E. Dam, is comparatively dry; the section about ½ mile downstream is quite wet. In some places downstream, crews are working in two or more inches of water.

These two sections of the tailrace channel excavation are divided into two distinct classes of river bedrock: the lower section is composed of hard, fine-grained diorite; the upper section consists of large granite boulders and granite ledges that cut diagonally across the river bed. The first drilling, blasting, and excavating operations were started in the diorite on the lower section of the tailrace channel. The original exposed bedrock consisted of jagged pinnacles and sawtooth ledges and boulders. These irregularities presented very difficult problems in drilling, particularly with regard to the movement of wagon drills into position for drilling operation in this rugged terrain.



LOADING DYNAMITE: Atkinson powder men loading Gelamite 2 in a drill hole preparatory to firing a blast in the tailrace channel.

Hard, Ragged Diorite Formation

On the first lift, in this ragged diorite formation of the lower section, it was impossible to maintain a specific drilling pattern. After a wagon drill was spudded into position on a pinnacle of rock, it was necessary to drill as many holes as possible from that setup. This made necessary the fanning out of holes in all directions in such a manner that the bottoms of the holes would be spaced close to prescribed distances apart, on a vertical plane, in accordance with the depth of hole drilled. Because of the character of the rock formation, the holes varied in depth to fit the conditions. Wagon drilling had to be supplemented with the drilling of jackhammer holes of varying depths and spacings.

Water was encountered in many of the holes that were expected to be dry. That situation, plus the fact that dynamite of the greatest density per foot of hole was indicated, necessitated the use of 40% Extra Gelatin dynamite—1¼ by 8-in. cartridges for the jackhammer drill holes and 2 by 12-in. cartridges for the wagon drill holes. The loading ratio in these holes, in terms of pounds per cubic yards of solid rock, was variable and had to be calculated on the basis of cubic yards of burden material on each hole. Rarely has a job in California presented such irregular rugged topography to a contractor as did the first lift on the lower section of this Folsom Dam tailrace channel. Considerable drilling of this first lift had been completed by the time the excavation equipment was ready, and the first blast was fired July 17, 1951.

The initial power shovel equipment consisted of two Bucyrus-Erie units, a 120-B and an 88-B, each with 2½-cu. yd. dippers. These were supplemented by a Bucyrus-Erie 54-B and an 80D Northwest. The shovels loaded into 14-cu. yd. Euclid trucks.

Serious Water Conditions

On the second lift in the lower section, more serious water conditions were encountered. Also, varying rock conditions in places where gravel deposits had filled the jagged interstices in the bedrock had to be contended with. This meant that 4-ft. lengths of

casings had to be used in the drill holes to prevent gravel and particles of fractured bedrock from falling in and causing the drills to stick. This condition also necessitated taking shorter lifts in some sections. To help obtain better initial fragmentation, 60% Extra Gelatin dynamite was used instead of 40% Extra Gelatin.

Holes are drilled with 1¼-in.-round drill steel equipped with Timken, Ingersoll-Rand, and Rockbit tungsten-carbide insert bits, in bit sizes ranging from 1⅞ in. for the jackhammers, and 2-, 2¼-, and some 3-in bits on the wagon drill steel rods. To expose rock surfaces for drilling successive lifts, a backhoe has been used to considerable advantage to scoop out deposits of sand, gravel, and small fragments of broken rock which accumulate in the interstices in the bedrock during excavation operations by power shovels, bulldozers, and trucks. Atkinson-Western 22-cu. yd. rock-bodied trucks are used extensively in the tailrace channel operations. The trucks, built especially for Atkinson in 1941, haul up a short grade to a stock pile, just above the present position of the Bucyrus-Erie 120-B shovel.

Carefully Controlled Blasting

On the Atkinson contract, under the supervision of the Bureau of Reclamation, short-period delay electric blasting caps, from first through tenth periods of delay, have proved to be effective for detonating dynamite charges in drill holes in the tailrace channel and the powerhouse site areas. Instantaneous electric blasting caps were also used in some of the blasts. Project Manager Steiner has kept the blasting operations, ranging from 500 to 700 holes per blast, under careful control. No serious damage has occurred despite the proximity of the P. G. & E. canal and the State Prison at Folsom. In firing the larger blasts, seismograph instruments have been used periodically to record vibrations. The results have been negative due, to a considerable degree, to the employment of short-period delay electric blasting caps as the detonating agents in the dynamite charges.

Drilling holes for blasting in the river bed is being handled by 25 wagon drills and a considerable number of jackhammer drills. The wagon drills are heavy-duty Gardner-Denver and Ingersoll-Rand units. Atkinson keeps from two to five drills ready at all times as stand-by equipment. Air for the drills is supplied by 18 compressors comprising Gardner-Denvers, Ingersoll-Rand's, Chicago Pneumatics, and Caterpillars.

The upstream section of the tailrace channel, extending from the second Folsom prison guard tower to a point some 500 ft. downstream from the P. G. & E. Dam is in a granite formation. It ranges from large, medium, and fine-grained boulders and ledge rock to decomposed and blocky coarse-grained granite. This material has been drilled more satisfactorily than the diorite and, while tough, has not presented the difficulties experienced on the lower section.

BIG BOULDERS: Blasting the boulders in the river bed called for drilling holes 18 ft. deep. A 120B shovel was used to excavate the broken material.

LEFT TO RIGHT: The Army Engineers staff included I. E. Burks, engineer, main dam; A. F. Kull, project engineer; W. G. Clark, engineer, earth fill dams.

Spacings of Drill Holes

The spacings of the drill holes in the solid materials have averaged about 1/3 their depth. For example, 12-ft. holes are spaced on 4-ft. centers; 14-ft. holes on 5-ft. centers; 18-ft. holes on 6 to 7-ft. centers. Gelatin Extra grades of dynamite in 40% and 60% strengths are being used, for the most part, in the tailrace channel area

excavation because of the extreme water condition. For the powerhouse excavation and the upstream tailrace section above stream bed, semi-gelatin and high-count ammonia grades of dynamite are used.

Trucks are loaded every three minutes and make a round trip in about 10 minutes. To limit down time on trucks, Steiner installed a secondary repair shop on the riverbank adjacent to the operating equipment. The crews use this emergency shop for any repairs which can be fixed on the spot. Major repairs, overhauls, and routine checks are made at the main garage and shop which is located beside the Atkinson Company's offices on the main highway about 1 mile from the tailrace channel.

After the tailrace job had started, the Atkinson crews dumped all spoil material into an access road which is being constructed for the convenience of the main dam contractor. When the access road neared completion, all spoil material was switched into stock piles beside the road. These stock piles will provide riprap for dams and dikes to be constructed beside the main dam structure.

Most of the excavation at the powerhouse site on the Atkinson job has been handled by a battery of four heavy-duty wagon drills, supplemented by jackhammer drill equipment for plug drilling the big granite boulders. This excavation has been brought down in relatively uniform lifts that average between 12 and 14 ft. Blast holes for the most part have been drilled 16 ft. deep on 6 to 7-ft. centers. The first two or three lifts were mostly in decomposed granite. This made possible the taking of wider hole spacings. As the excavation progressed, the granite formation became harder and closer hole spacing became necessary.

The supervising personnel on this Guy F. Atkinson Company contract is under the direction of A. H. Steiner, project manager, assisted by Joe Canto, excavation superintendent, Odis Riling, master mechanic, and Pat Chadwell, office manager. Drilling and blasting operations are handled by Chris Nielsen and Carl Schmidt, assisted by "Dutch" Edner, Martin Johnson, and Tony Falbo.

D and H Construction Company With M. H. Hasler

About 2 miles south of the river bed area, the fourth contractor, D and H Construction Company with M. H. Hasler, is building an earth fill dam between two hilly ridges about a mile apart. This dam, called Mormon Island Auxiliary Dam, is named for a vanished Mormon settlement that was established on the ridges some years ago. The new structure will average 120 ft. in height and will be exactly 1 mile in length. Fill for the dam will consist of a mixture of three different materials placed in four separate stock piles, side by side. The center pile is composed of tough clay; on each side of the center pile, decomposed granite is dumped; the next two outer piles contain screened dredger tailings in which sizes over 2 in. have been removed; and the final two piles are made up of unscreened dredger tailings. As the dam takes shape, the four materials will be consolidated

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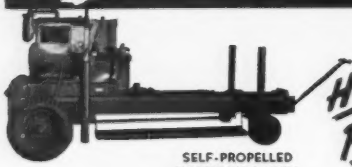

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and dumped as a unit for the fill.

The area in which the Mormon Dam is being constructed was well known in the 1860's for its gold production. After it became known that gold had been discovered at Sutter's Mill, farther north, Mormon Island became the scene of intensive gold exploration. Later, after the rush had subsided, the land under this area was dredged three times in further efforts to find gold. When the D and H crews began work on the island they found the site a mass of dredger tailings.

Supervisory Personnel

The staff of the Army Corps of Engineers includes Colonel Clarence C. Haug, chief of the Sacramento district offices; Arden F. Kull, project engineer; W. G. Clark, engineer, earth fill dams; I. E. Burks, engineer, main dam; and R. H. Shaw, office engineer. The Bureau of Reclamation staff is under the direction of H. E. McInnis, field engineer for the district office.

Work on the combined project is progressing satisfactorily, despite the difficulties that nature and man have imposed upon the contractors.

THE MOLES AWARDS

(Continued from page 178)

seaboard. Mr. Bechtel directed the construction of Canol Pipeline in Canada, as a partner in Bechtel-McCone, general contractors on the project. In the recent war years, his firm engaged in the building of military bases in Arabia, and at the present time it is busy on pipe-line construction jobs there. Since the war, he has directed operations on many pipe-line projects in the United States, including a section in New York State this year.

Bechtel company's wartime activities also include association with California Shipbuilding Corporation and Marinship Corporation, in the construction of ocean-going vessels for military and industry service.

The Bechtel Corporation comprises Bechtel Constructors; Bechtel International Corporation; International Bechtel, Incorporated; and Compania Bechtel, S. A.

Charles B. Spencer

Charles B. Spencer, born 64 years ago in New York City, received his elementary education in local public schools. In 1903, he enrolled at Columbia University and was graduated in 1910 with A.B. and C.E. degrees, and keys from two honorary societies, Sigma Xi and Tau Beta Pi. His graduation thesis, "Strength of Metals Under High Temperatures," was of such timely significance, particularly to the expanding automobile industry, that it was translated for publication and distribution in all parts of the world. During undergraduate days, he played on two of Columbia's championship teams—basketball and soccer.

In pre-World War I years, Mr. Spencer worked at a variety of jobs involving railroading, tunneling, architecture, and, finally, foundations and underpinning. Before leaving for France during the First World War, he was given a special leave of absence by the U. S. Army command to report on the settlement of the Cotton Exchange building erected on New Orleans mud.

Upon his return to this country after his war service, he joined with Lazarus White and E. A. Prentis to form an engineering-construction organization which was named Spencer, White & Prentis, Incorporated. After 32 years and a thousand contracts all over the world the firm is still going strong: harbor work in Persia, airports in the Bahamas, a bridge in Cuba, dry docks, tunnels, four sections of the New York subway system, the building of 100 tankers in Mobile, locks and dams on the Mississippi River, plus foundations and underpinning jobs in many places. Its latest accomplishment was the installation of underpinning at the White House in Washington.

Charles B. Spencer has served two terms as president of the General Contractors Association. During that time he was prominently identified with the revision of the New York City Building Code, a job he had been associated with previously in 1916 and again in 1936.

Previous Winners

In previous years, nonmembers honored by The Moles include Herbert Hoover, former President of the United States; General Brehon Somervell, wartime chief of the Army Service Forces; Lieutenant General Raymond A. Wheeler, former chief of engineers, U. S. Army; Admiral Ben Moreell, wartime commander of the Seabees; Robert Moses, New York City's park commissioner and construction coordinator; Harry W. Morrison, president of Morrison-Knudsen Company, world-famous in the construction and allied industries fields; and the late Frank T. Crowe, constructor of the Hoover, the Shasta, and other large dams and tunnels.

Members who have received The Moles Award in past years include William A. Durkin, president of Walsh Construction Company, builder of the Queens-Midtown Vehicular Tunnel, New York, and other important tunnel and heavy-construction projects; Arthur A. Johnson, whose company prepared the New York World's Fair site and built several sections of New York City's subways; William B. McMenimen, head of a contracting group that built a billion dollar's worth of Pacific Naval bases during World War II; Captain Thomas A. Scott, chairman of the board, Merritt-Chapman & Scott Corporation, one of the nation's largest construction firms; and Richard E. Dougherty, retired vice president of the New York Central Railroad system.

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NEWS NOTES

RUBBER-TIRED ROLLER

Shovel Supply Company, Box 1369, Dallas, Texas, manufacturer of a wide line of compaction equipment, announces its new Model RT-100S 50-ton rubber-tired roller. Exceptional results have been reported by the company, with this roller, in compaction of earthfill dams, fills for airfield runways, caliche, and crushed rock. These rollers are furnished for either sand or cast-iron ballast. Complete information may be obtained from the manufacturer.

CLEVELAND MODEL 80

The Cleveland Trencher Company's Model 80 is a one-man-operated machine that tamps, backfills, lays pipe, unloads and handles pipe, sheathing, and the like, and does all types of light crane work, according to a recent release by the company. This machine is mounted on a crawler having 24 separate travel speeds, ranging from one foot a minute to 2⅛ miles an hour. Detailed information is available by addressing the Cleveland Trencher Company, 20100 St. Clair Avenue, Cleveland, Ohio.

NEW DIESEL-POWERED COMPRESSOR

Highway, heavy-construction contractors, and quarry operators now have available the New Standard Model 365 air compressor manufactured by The Jaeger Machine Company, Columbus, Ohio. The new compressor utilizes a 165-hp. Model HRBI-600 Cummins Diesel, made by Cummins Engine Company, Inc., Columbus, Indiana, for its power plant. For further details, please communicate with The Jaeger Machine Company.

MINE POWER CENTER

A new ventilated dry-type mine power center is available from the Westinghouse Electric Corporation, 306 Fourth Avenue, Pittsburgh, Pennsylvania. An integral, skid-mounted unit, the power center features compact, low-height design—36 in. high, 45 in. wide, 104 in. long. The unit consists of a high-voltage section, a transformer, and a low-voltage section. The high-voltage section consists of a cable disconnecting plug and receptacle (optional) and a primary circuit breaker if desired. Each breaker is equipped with ground-fault protection, according to Westinghouse Corporation.

SAFETY SWITCH LOCK

A safety switch lock has been installed on the new lightweight models produced by Beaver Pipe Tools, Inc. of Warren, Ohio, which makes it impossible to start the machine until the chuck wrench has been removed from the chuck and placed in its holder, according to the manufacturer. This feature replaces the old-style wrench ejector which threw out only special types of wrenches.

AIR-CONDITIONING EQUIPMENT

Dravo Corporation, Pittsburgh, Pennsylvania, has developed a new type of equipment for air conditioning cabs of cranes operating in high temperatures or in atmospheres contaminated by toxic and noxious gases or dusts. The company reports that with this equipment, known as the Split-Type Crane Cab Cooler, no duct work is needed for installation because the cooling section is installed in the cab itself and the larger condenser is placed outside on the crane. Address the company direct for more details.

ALFCO PRESSURIZED FIRE-GUN

A new air-pressurized fire extinguisher has been announced by the American-LaFrance-Foamite Corporation of Elmira, New York. This one-quart extinguisher is called the Alfco Pressurized Fire-Gun and carries the inspection and approval label of Underwriters' Laboratories. It discharges vaporizing liquid fluid for extinguishing both flammable liquid and electrical type fires.

Fully illustrated literature may be obtained by writing direct to the company.

HARD HATS

Wearers of hard hats out on the job will be pleased to hear of a new sponge rubber shock-absorbing pad that may be attached to their helmets by merely pressing the affixed self-adhering strip firmly against the hat under the headband. E. D. Bullard Company, the manufacturer, claims that the sizing features of the safety hats are retained and that standard headband assemblies may be used. The address of the Bullard Company is 275 Eighth Street, San Francisco 3, California.

GAS-TIGHT GOGGLES

A new rubber frame goggle, designed to provide a gas-tight seal and recommended for gas, fume, and smoke hazards, is announced by American Optical Co., Southbridge, Massachusetts. It is constructed without any ventilation slots in the rubber frame to prevent infiltration of air.

The new AO 701 goggle may be obtained in combination with American Optical's respirators. For additional information, please address the company direct.

The Explosives Engineer on Microfilm

The six issues of THE EXPLOSIVES ENGINEER published in 1950, which comprise Volume 28, are available on microfilm. This step has been taken to meet the pressing problem of shelf and storage space which faces all public and special libraries today.

Inquiries concerning purchase of the microfilm edition should be addressed to University Microfilms, 313 N. First Street, Ann Arbor, Michigan.

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Regular cloth-bound volumes will continue to be available from the publication's editorial offices, 990 King Street, Wilmington, Delaware, at the regular price of $3.50 (United States and Canada); $4.50 to post-office addresses in other countries.

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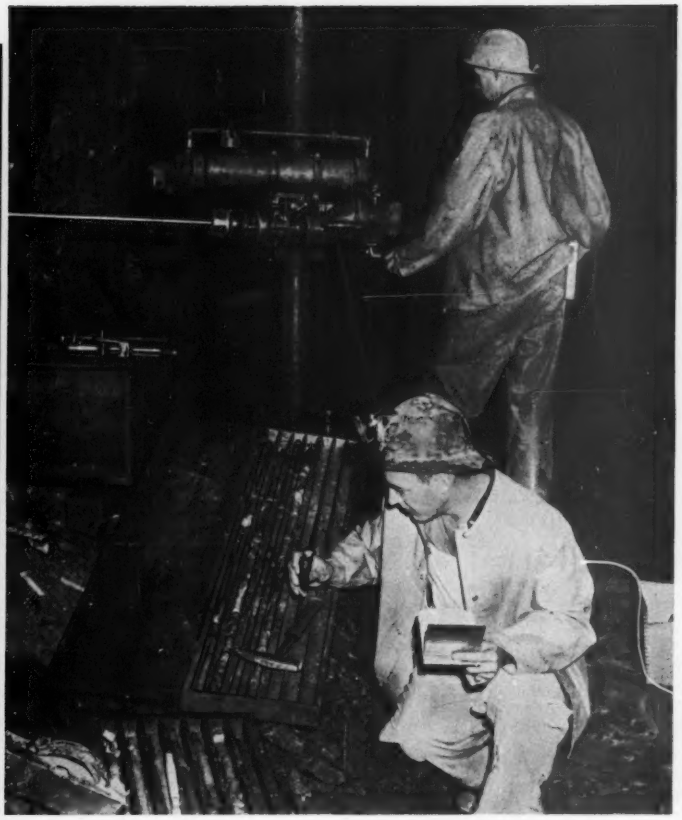

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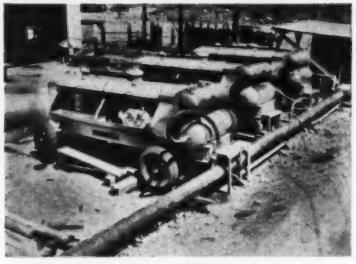

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